CLAIMS:

We claim:

1. An article comprising an all-pass optical filter including

an input port for receiving an input optical pulse having a regular repetition rate;

an output port;

a splitter/combiner; and

one feedback path, wherein the all-pass optical filter is configured to apply a plurality of frequency-dependent time delay periods to the input optical pulse to define a time delay spectrum having a plurality of delay peaks, and the free spectral range of the filter as defined by the spacing between the delay peaks is matched to the regular repetition rate of the input optical pulse.

2. The all-pass optical filter of claim 1 in which the one feedback path comprises a ring resonator and a heating element for heating a section of the ring resonator.

3. The all-pass optical filter of claim 1 arranged in parallel with a Mach-Zehnder interferometer.

4. The all-pass optical filter of claim 1 in which the free-spectral range of the filter is matched to the repetition rate of the pulse train by the free-spectral range being equal to ~~the~~ repetition rate.

5. An assembly for use in an optical communication system comprising an optical multiplexer/demultiplexer device including the all-pass optical filter of claim 4.

6. The all-pass optical filter of claim 1, in which the free-spectral range of the filter is matched to the repetition rate of the pulse train by the free-spectral range being offset from the repetition rate by a sufficiently small degree that each frequency of the pulse train falls within a bandwidth of one of the plurality of delay peaks.

7. An assembly for use in an optical communication system comprising a pulsed laser and the all-pass optical filter of claim 6, in which the all-pass optical filter corrects linear chirp of the pulsed laser.

8. An optical communications system comprising the all-pass optical filter of claim 1.

9. An optical communications system comprising the assembly of claim 5.

10. An optical communications system comprising the assembly of claim 7.

11. A method of generating a tunable delay for an optical signal with use of a single-stage all-pass optical filter wherein the pulse train of the optical signal has a regular repetition rate, the method comprising matching the spacing between the frequency-dependent time delay peaks generated by the all-pass optical filter to the repetition rate of ~~the pulse train.~~

12. The method of claim 11, in which the free-spectral range of the filter is matched to the repetition rate of the pulse train by the free-spectral range being equal to the repetition rate.

13. The method of claim 11, in which the free-spectral range of the filter is matched to the repetition rate of the pulse train by the free-spectral range being offset from the repetition rate by a sufficiently small degree that each frequency of the pulse train falls within a bandwidth of one of the plurality of delay peaks.

14. A method for correcting linear chirp of a pulsed laser comprising the steps of:

providing an all-pass optical filter including an input port for receiving an input optical pulse having a regular repetition rate; an output port; a splitter/combiner; and one feedback path, wherein the all-pass optical filter is configured to apply a plurality of frequency-dependent time delay periods to the input optical pulse to define a time delay spectrum having a plurality of delay peaks, and

off-setting the free spectral range of the filter as defined by the spacing between the delay peaks from the regular repetition rate of the input optical pulse by a predetermined value such that each frequency of the pulse train falls within a bandwidth of one of the plurality of delay peaks, wherein the predetermined value is selected to substantially equalize the linear chirp of the pulsed laser.

15. A method for synchronizing control signals with transmission signals of an optical time-division multiplexer/demultiplexer system, the method comprising

providing an all-pass optical filter including an input port for receiving an input optical pulse having a regular repetition rate; an output port; a splitter/combiner; and one feedback path, wherein the all-pass optical filter is configured to apply a plurality of frequency-dependent time delay periods to the input optical pulse to define a time delay spectrum having a plurality of delay peaks,

configuring the free spectral range of the all-pass optical filter as defined by the spacing between the delay peaks to be equal to the regular repetition rate of the input optical pulse, and

applying the all-pass optical filter to the control signals to delay the control signals, thereby synchronizing the control signals with the transmission signals.